

## IN THE CLAIMS

What is claimed is:

1 1. A wavelength reference comprising:  
2       at least one gas-tunable etalon including at least one reflecting surface pair  
3       having first and second reflective surfaces; and  
4       said reflecting surface pair surrounding a cavity, said cavity being filled with  
5       a gas-tunable medium having a variable optical index of refraction; wherein  
6       said at least one gas-tunable etalon produces equally-spaced spectral lines  
7       which are variable in response to changes in the gas properties of said gas-tunable  
8       medium, said spectral lines being tuned to align to an external wavelength  
9       standard, and the properties of said gas-tunable medium then being fixed, so that  
10      said at least one gas-tunable etalon acts as a wavelength reference.

---

1 2. The wavelength reference of claim 1, wherein:  
2       said etalon includes an enclosure surrounding a cavity which is filled with  
3       gas, and tuning of said etalon is done by variation in the pressure of the gas in the  
4       cavity.

1 3. The wavelength reference of claim 1, wherein:  
2       said etalon includes an enclosure surrounding a cavity which is filled with  
3       gas, and tuning of said etalon is done by variation in the composition of the gas in  
4       the cavity.

---

1 4. The wavelength reference of claim 1, wherein:  
2       said wavelength standard is the ITU grid.

*Sub  
A1*

1 5. The wavelength reference of claim 1, wherein:  
2       said at least one etalon includes said second reflecting surface which is at  
3       least partially transmissive.

4 6. A method for producing a wavelength reference, comprising:  
5       A) providing at least one etalon which includes a gas-tunable medium  
6       having an variable optical index of refraction;  
7       B) introducing radiation into said etalon, whereby a plurality of equally  
8       spaced spectral lines is produced;

9       C) tuning said etalon by varying said variable optical index of refraction  
10      of said gas-tunable medium, to align said plurality of spectral lines with an external  
11      wavelength standard; and  
12      D) fixing said variable optical index of refraction included in said etalon,  
13      so that said plurality of spectral lines produced remains substantially aligned with  
14      said external wavelength standard.

1 7. The method for producing a wavelength reference of claim 6, wherein:  
2       said etalon includes an enclosure surrounding a cavity which is filled with  
3       gas, and tuning of said etalon in step C is done by varying the pressure of the gas in  
4       the cavity.

1 8. The method for producing a wavelength reference of claim 6, wherein:  
2       said etalon includes an enclosure surrounding a cavity which is filled with  
3       gas, and tuning of said etalon in step C is done by variation in the composition of  
4       the gas in the cavity.

1 9. The method for producing a wavelength reference of claim 6, wherein:  
2 said wavelength reference is the ITU grid.

1 10. The method for producing a wavelength reference of claim 6, wherein:  
2 said at least one etalon includes a second reflecting surface which is at least  
3 partially transmissive.

1 11. A process for making a wavelength reference, comprising the steps of :  
2 A) forming at least one etalon which includes a pair of reflecting surfaces  
3 and enclosure walls surrounding a cavity filled with gas of variable pressure and  
4 composition, and which produces a medium of variable optical index of refraction;  
5 B) introducing radiation into said etalon, whereby a plurality of equally  
6 spaced spectral lines is produced;  
7 C) tuning said etalon by varying said variable optical index of refraction,  
8 to align said plurality of spectral lines with an external wavelength standard; and  
9 D) fixing said variable optical index of refraction included in said etalon,  
10 so that said spectral line produced remains substantially aligned with said external  
11 wavelength standard.

1 12. A wavelength reference produced by the process of claim 11.

1 13. A method for producing an ITU wavelength reference, comprising:  
2 A) providing at least one etalon including at least one reflecting surface  
3 pair having first and second reflective surfaces, said reflecting surface pair  
4 surrounding a cavity, said cavity being filled with a gas-tunable medium having a  
5 variable optical index of refraction inside a sealable enclosure;  
6 B) introducing a beam of incident light into said etalon, whereby at least

7 one spectral line is produced;

8       C) comparing said at least one spectral line with an ITU wavelength  
9 standard;

10      D) tuning said etalon by varying pressure in said etalon to adjust said  
11 variable optical index of refraction to align said at least one spectral line with said  
12 ITU wavelength standard; and

13      E) fixing said variable optical index of refraction included in said etalon  
14 by sealing said sealable enclosure, so that said at least one spectral line produced  
15 remains substantially aligned with said ITU wavelength standard.

14. A method for producing an ITU wavelength reference, comprising:

1       A) providing at least one etalon including at least one reflecting surface  
2 pair having first and second reflective surfaces, said reflecting surface pair  
3 surrounding a cavity, said cavity being filled with a gas-tunable medium having a  
4 variable optical index of refraction inside a sealable enclosure;

5       B) introducing a beam of incident light into said etalon, whereby at least  
6 one spectral line is produced;

7       C) comparing said at least one spectral line with an ITU wavelength  
8 standard;

9       D) tuning said etalon by varying the gas composition in said etalon to  
10 adjust said variable optical index of refraction to align said at least one spectral line  
11 with said ITU wavelength standard; and

12      E) fixing said variable optical index of refraction included in said etalon  
13 by sealing said sealable enclosure, so that said at least one spectral line produced  
14 remains substantially aligned with said ITU wavelength standard.